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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor: Tatsuo Hara

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Serial No.: Not Yet Assigned
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Examiner: Not Yet Assigned

Filed: Herewith

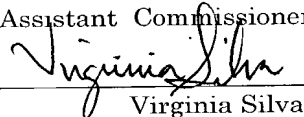
Title: Spring, Drive Mechanism, Device and Timepiece Using the Spring

CERTIFICATION UNDER 37 CFR 1.10

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I hereby certify that this Preliminary Amendment is being deposited with the United States Postal Service in an envelope as "Express Mail Post Office to Addressee" under 37 CFR 1.10 on the date indicated below and is addressed to Assistant Commissioner for Patents, Washington, D.C. 20231".

Dated: March 8, 2002


Virginia Silva

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Preliminary to examination please amend the above-identified application as follows:

IN THE CLAIMS:

Please substitute the following clean amended claims 1, 3-6, 8, 9, and 11-15 for the original claims with the same number. Marked-up versions of the amended claims follow the Remarks section of this Amendment.

1. (Amended) A spring manufactured by processing an elastic material, wherein at least a part of the surface of the material is formed with a film having composition and mechanical characteristics different from the material.

3. (Amended) The spring according to claim 1, wherein the film comprises a plurality of layers.

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4. (Amended) The spring according to claim 1, wherein the material is processed in a band-shape and wound in a helical shape so that the spring becomes a mainspring.
5. (Amended) The spring according to claim 1, wherein the film is formed on a surface to which a compressive force is applied when the material is elastically deformed.
6. (Amended) The spring according to claim 1, wherein the film is a thin film of a substance harder than the material coated on the surface of the material.
8. (Amended) The spring according to claim 6, wherein the thin film is formed on the material by a physical vapor evaporation of which the film-forming temperature is about room temperature.
9. (Amended) The spring according to claim 1, wherein the film is a diffusion layer formed harder than the material by diffusing a diffusion substance strongly bonded with a composition constituting the material from the surface of the material to the inside.
11. (Amended) The spring according to claim 9, wherein the diffusion layer is formed on the material by a diffusion treatment which supplies a gas including a molecule containing element of the diffusion substance into a high-vacuum furnace and the diffusion substance is diffused from the surface of the material to the inside.
12. (Amended) A driving mechanism comprising a power source, wherein the power source is a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.
13. (Amended) A device comprising a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.

14. (Amended) An electronic control timepiece, comprising:

- a mechanical energy accumulator for accumulating a mechanical energy;
- a power generator driven by the mechanical energy accumulator;
- a gear train for mutually connecting the mechanical energy accumulator and the power generator;
- an indicator connected to the gear train; and
- a rotation controller for controlling rotary speed of the power generator,

wherein the mechanical energy accumulator comprises a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.

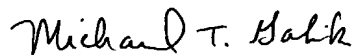
15. (Amended) A timepiece comprising a mechanical energy accumulator which drives the timepiece, wherein the mechanical energy accumulator comprises a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.

REMARKS

Claims 1-15 are presented for examination. Each of claims 1, 3-6, 8, 9, and 11-15 has been amended for a reason or reasons unrelated to the statutory requirements for patentability, namely, to eliminate multiple dependency and/or to improve the form of the claim.

Favorable consideration is respectfully requested.

Respectfully submitted,



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Version with Markings to Show Changes Made

1. (Amended) A spring manufactured by processing an elastic material, wherein at least a part of the surface of the material is formed with a film having composition and mechanical characteristics different from the material.

3. (Amended) The spring according to claim ~~1-or-2~~, wherein the film comprises a plurality of layers ~~of the film are provided~~.

4. (Amended) The spring according to ~~any one of claims 1 to 3~~claim 1, wherein the material is processed in a band-shape and wound in a helical shape so that the spring becomes a mainspring.

5. (Amended) The spring according to ~~any one of claims 1 to 4~~claim 1, wherein the film is formed on a surface to which a compressive force is applied when the material is elastically deformed.

6. (Amended) The spring according to ~~any one of claims 1 to 5~~claim 1, wherein the film is a thin film of a substance harder than the material coated on the surface of the material.

8. (Amended) The spring according to claim ~~6-or-7~~, wherein the thin film is formed on the material by a physical vapor evaporation of which the film-forming temperature is ~~around~~ about room temperature.

9. (Amended) The spring according to ~~any one of claims 1 to 5~~claim 1, wherein the film is a diffusion layer formed harder than the material by diffusing a diffusion substance strongly bonded with a composition constituting the material from the surface of the material to the inside.

11. (Amended) The spring according to claim ~~9-or-10~~, wherein the diffusion layer is formed on the material by a diffusion treatment which supplies a gas including a molecule containing element of the diffusion substance into a high-vacuum furnace and the diffusion substance is diffused from the surface of the material to the inside.

12. (Amended) A driving mechanism comprising using a spring according to any one of claims 1 to 11 as a power source, wherein the power source is a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.

13. (Amended) A device using comprising a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material according to any one of claims 1 to 11.

14. (Amended) An electronic control timepiece, comprising:

a mechanical energy accumulator for accumulating a mechanical energy;
a power generator driven by the mechanical energy accumulator;
a gear train for mutually connecting the mechanical energy accumulator and the power generator;

an indicator connected to the gear train; and

a rotation controller for controlling rotary speed of the power generator,

wherein the ~~spring according to any one of claims 1 to 11 is used as the~~ mechanical energy accumulator comprises a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.

15. (Amended) A timepiece comprising a mechanical energy accumulator and ~~being driven by the mechanical energy accumulator, wherein the spring according to any one of claims 1 to 11 is used as the mechanical energy accumulator~~ which drives the timepiece, wherein the mechanical energy accumulator comprises a spring manufactured by processing an elastic material, at least part of the surface of which is formed with a film having composition and mechanical characteristics different from the material.